ADDITIONAL FEES:

No additional fees are believed required; however, should it be determined that a fee is due, authorization is hereby given to charge any such fee to our Deposit Account No. 01-0268.

REMARKS

In the last Office Action, claims 1-8 and 10-21 were rejected under 35 U.S.C. §103 as being unpatentable over Miyazawa, Iino or Suzuki in view of Snek, Tokusina or Kawai. The Examiner stated that each of Miyazawa, Iino and Suzuki disclose the self-excited vibration motor including a rotor, a stator base, a pressing means and a drive circuit. The Examiner stated that while the references do not explicitly teach providing electrical insulation, providing proper insulation to protect workers or equipment from shock hazards or short circuiting would have been within the skill expected of the routineer. The Examiner also pointed out that each of Saeki, Tokusima and Kawai teach that it is well known to provide piezoelectric ultrasonic motors with various parts formed of insulation material, including rotors, stators and pressing members. In view of this, the Examiner concluded that providing parts of Miyazawa, Iino or Suzuki with insulation materials would have been obvious.

Applicants respectfully traverse the foregoing claim rejections.

Preliminarily, applicants note that the use of insulation to protect workers from electrical shock does not provide any motivation to modify the cited references to replicate the claimed invention. The ultrasonic motor is a miniature device and does not produce a large voltage or current. Moreover, the ultrasonic motor is used in a small device such as a timepiece which does not produce a voltage or current sufficiently large to present a shock hazard.

The prior art teaches ultrasonic motors formed of conductive materials and does not suggest the claimed configuration or the use of insulation to eliminate a current path. Moreover, the amended claims recite that a specific part of the ultrasonic motor that would serve as a current path between the conductive plate to which the motor is mounted and the piezoelectric element of the motor is formed of an insulator or has an insulative surface so that an additional insulator is not needed to eliminate the current path.

The present invention relates to an improved configuration for an electronic device having an ultrasonic motor. As pointed out by applicants in the specification, it has become relatively common to form a mounting plate of a

timepiece to which the movement is mounted of a conductive material so that the plate can serve as a current path for carrying current from a battery to the movement. When it is desired to mount an ultrasonic motor to the timepiece for driving a calendar wheel or the like, however, a current path is formed between the conductive plate and one or more electrodes of the piezoelectric element of the ultrasonic motor. This makes it impossible to operate the ultrasonic motor in a stable manner Since the motor is mounted to a conductor carrying a power source current, the driving circuit of the ultrasonic motor may short circuit the piezoelectric element by virtue of an unintended current path formed between these elements. An example of this problem is illustrated in Fig. 11 of the application drawings, which shows an analog timepiece driven by an ultrasonic motor. A base plate 21 of the timepiece is directly connected to the positive terminal of a power supply for driving the clock and serves as a lead wire for carrying a positive potential to the movement. Forming the base plate 21 as a current-carrying member is done to minimize product manufacturing cost and conserve space. However, this causes a problem when an ultrasonic motor is mounted to the base plate 21 because electrodes of the piezoelectric device 4 become short-circuited with the positive power supply terminal through the base plate 21 and stable driving becomes impossible.

According to the present invention, a specific measure is utilized to ensure that insulation is provided between the conductive member of the electronic device to which the ultrasonic motor is mounted and the piezoelectric element of the motor. The claimed invention thus addresses a specific problem arising when an ultrasonic motor is mounted to a conductive member of an electronic device where a current path would otherwise exist between a power supply of the electronic device and a piezoelectric element of the ultrasonic motor. The amended claims recite a structure in which an ultrasonic motor is mounted to a conductor of an electronic apparatus carrying a power supply current thereof so that a potential current path exists between the power supply of the electronic device and the piezoelectric element of the ultrasonic motor. The claims do not merely recite a generic ultrasonic motor having an element formed of an insulating material. The independent claims explicitly require a specific configuration which results in the existence of a current path between the power supply for powering the self-oscillating drive circuit and the piezoelectric element of the conventional ultrasonic motor.

Even though the cited references disclose ultrasonic motors having one or more insulating members, none of the references discloses an electronic device having an ultrasonic

motor mounted to a conductor having a power supply current passing therethrough.

If the motors of the cited references were mounted to a conductor of an electronic apparatus, a current path would be formed between the conductor and a terminal of the piezoelectric element of the motor. The claimed invention terminates this current path by forming an insulating member between the conductor of the electronic apparatus and the piezoelectric member of the ultrasonic motor so that the current path cannot be formed. Even though one or more components of the ultrasonic motors of the cited prior art may be formed of an insulating material, this does not imply that if such motors were mounted directly to a conductive member of an electronic device through which a power supply current is passed, a current path between the conductor of the electronic apparatus and the piezoelectric element of the motor is eliminated.

In view of the foregoing, applicants respectfully submit that claims 1-8 and 10-21 are not rendered obvious by the cited references.

In analyzing independent claims 1 and 13, it must be kept in mind that the claims do not simply prescribe the use of an insulating material in an ultrasonic motor. They require the use of an insulating material to form a specific

member of the ultrasonic motor that if formed of a conductor would serve as a current path between the conductive member of the electronic device to which the motor is mounted and the piezoelectric element of the motor of an insulative material. The specific member is at least one of the oscillating member, the pressing mechanism and the moving body which would, if formed of a conductor, provide a current path between a conductor to which the ultrasonic motor is mounted and at least one electrode of the piezoelectric element of the motor.

By merely forming an indiscriminate component of the motor of an insulating material, a current path between the power source and the piezoelectric element would not be prevented unless the ultrasonic motor is mounted so that such component is in electrical contact with the power source and the piezoelectric element. Since the cited references contain no such disclosure, the obviousness rejections do not satisfy the standard for obviousness under 35 U.S.C. §103(a) and the rejection of claims 1-8 and 10-21 should therefore be withdrawn.

Conventional attempts to prevent a current path from developing between the power supply of the driving circuit and the piezoelectric element involve the use of a base plate 21 (see Fig. 11) formed of an insulating material or the provision of a separate insulator between the base plate 21

and the ultrasonic motor. As noted above, however, this increases the size and cost of the device.

The foregoing problem exists because various components of the ultrasonic motor are formed of conductive materials thus necessitating the use of additional, insulating materials. Absent the use of an insulator wherever a current path is likely to exist between the power supply and the piezoelectric element, short-circuiting becomes a concern. When a voltage is applied to the base plate 21 of the above-described analog clock, for example, a current path can easily be formed between at least one of the electrodes of the piezoelectric element and at least one of the power supply terminals. This makes stable driving of the motor impossible.

Since various components of the ultrasonic motor are formed of conductive materials, avoidance of this problem makes it necessary to terminate the current path between the power supply and the piezoelectric device by forming components of the electronic device contacting the ultrasonic motor of a non-conductive material. However, this imposes restrictions on the electronic device structure in which the ultrasonic motor is mounted. In a small electronic device, it is difficult to provide an insulating structure due to space restrictions and, if an insulating structure is mounted therein, it may be difficult or impossible to also mount an ultrasonic motor.

The present invention overcomes the foregoing difficulties by providing an ultrasonic motor which can be mounted in an electronic device without concern of short-circuiting in the manner described above and without imposing structural restrictions on the electronic device.

In accordance with the present invention recited by independent claim 1, the ultrasonic motor is mounted to a conductive member of an electrical apparatus having a power supply for supplying power to an electrical device and a movable member driven by an ultrasonic motor. The ultrasonic motor is mounted to a conductive member through which a power supply current is passed from the power supply to the electrical device. The ultrasonic motor comprises a driving circuit for producing an oscillatory wave and a power source for powering the driving circuit. A piezoelectric element is driven by the driving circuit to undergo vibration and the piezoelectric element and the driving circuit cooperate to form a self-oscillation circuit.

As further recited by independent claim 1, the ultrasonic motor is provided with an oscillating member in contact with the piezoelectric element for oscillating in response to vibration of the piezoelectric element, a moving body contacting the oscillating member to undergo movement in

response to oscillation of the oscillating member, and a pressing mechanism for urging the moving body against the oscillating member.

Amended claims 1 further provides that the ultrasonic motor is mounted to the conductor such that a current path would exist between the conductor and an electrode of the piezoelectric element if the components of the ultrasonic motor were formed of conductive materials, and at least one of the oscillating member, the pressing mechanism and the moving body which could, if formed of a conductor, provide the current path between the conductor and the electrode of the piezoelectric element is formed of an insulating material. As set forth as a negative limitation in claim 1, the recited configuration prevents formation of the current path without the need for an additional insulator between the conductor and the ultrasonic motor.

Claim 13 contains similar language, and requires that at least one component of the ultrasonic motor which, if formed with a conductive surface, would serve as a current path between the conductive member of the electronic device to which the motor is mounted and an electrode of the piezoelectric element, is formed with an insulating surface so that an additional insulator is not required therebetween.

In the conventional device having an ultrasonic motor as described above, the power source of the device, which also provides power to the driving circuit of the ultrasonic motor, is provided with a conductive base plate to reduce the size and production cost of the device. However, this results in a product in which a current path exists between the power supply and the piezoelectric element (or self-oscillating drive circuit) of the ultrasonic motor. This makes stable operation of the motor impossible.

The present invention overcomes this problem by providing that one or more members of the ultrasonic motor which forms the current path is formed of an insulator.

Therefore, in analyzing the claims, it must be kept in mind that the claims recite a structure in which a current path that would otherwise exist between a power supply of an electronic device and a self-oscillating drive circuit of an ultrasonic motor is prevented by forming the member which, if formed of a conductor would provide the current path, of an insulating material. A claim reciting such structure is not met by any ultrasonic motor or by the disclosure of an ultrasonic motor in which an arbitrary element is formed of an insulator; that is, unless that arbitrary element, if formed of a conductor, would serve as a current path between the

conductive plate of the electronic device to which the motor is mounted and the piezoelectric element (or self-oscillating drive circuit) of the ultrasonic motor. The cited prior art contains no such disclosure.

Absent any disclosure or suggestion in the art that (1) a current path exists between a mounting plate of the device and the piezoelectric element of the motor; and (2) one or more elements of the ultrasonic motor which provides the current path is formed of an insulator, the claims are patentably distinct over the prior art.

That is, not only must the art show that one or more of the oscillating member, the pressing mechanism, the moving body and the output member is formed of an insulating member, but that such element would serve as a current path between the conductive member of the electronic device to which the motor is mounted and the piezoelectric element were it not formed of an insulator.

Stated otherwise, the claims do not recite an ultrasonic motor in which an arbitrary "one or more" elements is formed of an insulating material. The claims recite a device in which the member in which the above-described current path is formed is produced of an insulating material so that the current path is prevented.

As a result of the foregoing structure, a current path is not formed between a power supply terminal and an electrode of a piezoelectric element since the member responsible for producing the current path, i.e., one or more of the oscillating member, the pressing mechanism, the moving body and the output means, is insulative in nature. It is thus possible to realize an ultrasonic motor which does not impose structural restrictions on a device in which it is mounted.

Furthermore, an object of the present invention is to provide an ultrasonic motor with stable operating characteristics using a self-oscillating drive circuit formed by a driving circuit and a piezoelectric element. The claims recite a structure for an ultrasonic motor of the foregoing type in which insulation is provided between the self-oscillating drive circuit comprising an oscillating body, a piezoelectric element, an oscillation drive circuit and other members (supporting mechanism, moving body and pressing mechanism). Insulation provided between the self-oscillating driving circuit and the other member is, for example, to prevent the oscillating body from serving as an electric element in the self-oscillating driving circuit.

None of the cited references recognizes the current path described above, and none of the references discloses or

suggests means for overcoming the problem associated with the current path.

A claim rejection based upon obviousness must be supported by evidence establishing the obviousness of each and every limitation of a rejected claim. Such evidence may consist of a reference which directly establishes this lack of novelty, or a line of reasoning consistent with and motivated by the cited art establishing that such limitations would have been obvious. Anything else is inadequate to meet this burden. There must be some teaching, reason, suggestion, or motivation found in the prior art that renders every limitation of a claim obvious to support an obviousness rejection under 35 U.S.C §103(a). See, e.g., Symbol Technologies, Inc. v. Opticon, Inc., 935 F.2d 982, 989, 18 USPQ2d 1885 (Fed. Cir. 1991). This burden cannot be met by citing references that, even if combined, fail to teach explicitly recited limitations.

Stated otherwise, an obviousness rejection under 35 U.S.C §103(a) cannot rely solely upon a combination of references that teach some limitations of a claim and omit others.

A continued rejection of independent claims 1 or 13 under §103(a) cannot be supported on the basis of the cited

references. As pointed out by the Board in Ex Parte Clapp, 227 USPQ 972, 973 (BPAI 1985):

> To support the conclusion that the claimed combination is directed to obvious subject matter, either the references must expressly or impliedly suggest the modifications urged by the examiner to have been obvious.

The same situation exists here. There is nothing in the references that would expressly or impliedly teach or suggest the modifications required to the cited references to replicate the claimed invention. Nothing in any of the cited references would have suggested to one of ordinary skill in the art an ultrasonic motor that is mountable in an electronic device in such a manner that produces a current path between a power supply of the apparatus and a piezoelectric element of the motor, and the use of a member of the ultrasonic motor formed of an insulating material or having an insulating surface to eliminate this current path. The use of an insulating material to form an arbitrary part of an ultrasonic motor does not assure elimination of the above-described current path.

In view of the foregoing amendments and discussion, the application is now believed to be in condition for

allowance. Accordingly, favorable reconsideration and allowance of the claims are most respectfully requested.

Respectfully submitted,

ADAMS & WILKS
Attorneys for Applicants

By: _____
Bruce L. Adams
Reg. No. 25,386

50 Broadway
31st Floor
New York, NY 10004
(212) 809-3700

MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the United States Postal Service as first-class mail in an envelope addressed to: Commissioner of Patents & Trademarks, Washington, D.C. 20231, on the date indicated below.

Bruce L. Adams
Attorney Name

Signature

JULY 9, 2001
Date

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1 and 13 have been amended as follows:

1. (Twice Amended) In an electrical apparatus having a power supply for supplying power to an electrical device and a movable member driven by an ultrasonic motor, the ultrasonic motor being mounted to a conductive member through which a power supply current is passed from the power supply to the electrical device, the [An] ultrasonic motor comprising: a driving circuit for producing an oscillatory wave; a power source for powering the driving circuit; a piezoelectric element driven by the driving circuit to undergo vibration, the piezoelectric element and the driving circuit cooperating to form a self-oscillation circuit; an oscillating member in contact with the piezoelectric element for oscillating in response to vibration of the piezoelectric element; a moving body contacting the oscillating member to undergo movement in response to oscillation of the oscillating member; and a pressing mechanism for urging the moving body against the oscillating member; wherein the ultrasonic motor is mounted to the conductor such that a current path would exist between the conductor and an electrode of the piezoelectric element if the components of the ultrasonic

motor were formed of conductive materials, and at least one of the oscillating member, the pressing mechanism and the moving body which could, if formed of a conductor, provide the [a] current path between the conductor [at least one terminal of the power source] and the [at least one] electrode of the piezoelectric element is formed of an insulating material so as to prevent formation of the current path without the need for an additional insulator between the conductor and the ultrasonic motor.

13. (Amended) In an electronic apparatus having a power supply for supplying power to an electrical device and a movable member driven by an ultrasonic motor, the ultrasonic motor being mounted to a conductive member serving through which a power supply current is passed from the power supply to the electrical device, the ultrasonic motor comprising: a piezoelectric element; a driving circuit cooperating with the piezoelectric element to form a self-oscillation circuit for vibrating the piezoelectric element; a power source for supplying power to the elctronic apparatus and to the driving circuit; an oscillating member in contact with the piezoelectric element to undergo oscillation in response to vibration of the piezoelectric element; a moving body disposed on the oscillating member to undergo movement in response to oscillation of the oscillating member; and a pressing

mechanism for urging the moving body against the oscillating member; wherein the ultrasonic motor is mounted to the conductor such that a current path would exist between the conductor and an electrode of the piezoelectric element if the components of the ultrasonic motor were formed of conductive materials, and at least one component of the ultrasonic motor which, if formed with a conductive surface, could serve as the [a] current path between the conductor [power source] and the [an] electrode of the piezoelectric element, is formed with an insulating surface so that an additional insulator is not needed between the conductor and the ultrasonic motor.